

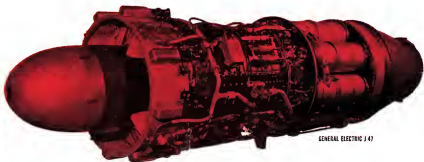
AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JULY 7, 1952

50 CENTS

BG



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MODEL
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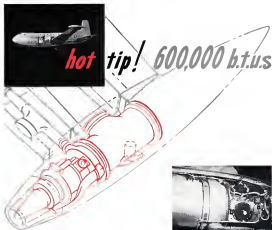
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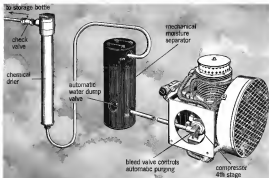


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Aviation Week

Volume 57

July 7, 1952

Number 1

Secrets of MIG Revealed 10

subminiature pressure transducer



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Headline News

F-10C Nearly 40 American Fighters
Heavy First Five Losses to Europe
15th Air Force (British Jet)
Eisen: Turkey Clerk for AA
EAL: Airline Spills 50,000 Pounds

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Remarkable in 1929



Today "air tractors" transfer large quantities of fuel with speed and economy. Here a Boeing DC-30 tanker pumps fuel into a Boeing B-47 bomber by means of the "Flying Boom" device. This, and several refinements in pumps, valves and controls make these modern refueling airplanes versatile service aircraft on the job.

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Please identify portions of illustration for parts and prices. Send actual inquiry for more information.



Domestic

Fourth-quarter materials allocation apparently has been held up by Defense Production Administration pending settlement of the steel strike. DPA won't know how much material is available until all of the strike losses are known.

Daniel L. Belavacke is legal president of the Air Line Pilots Assn., according to a ruling in Chicago by U. S. District Judge William Leakey. The order was scheduled to take effect July 30. ALPA directors ask a stay of the order pending appeal. They claimed Belavacke and several Charter Boyce president July 15, 1971. Leakey decided that the move was not supported on its grounds with assistance by law.

Eighty B-36 bombers to cross the Atlantic via 21 bombers which landed in England June 27 after eight from Texas with one stop at Limestone AFB, Mo. Plans were scheduled to return to their home base after a brief visit.

Personal plane collided with American Airlines' DC-6 near Field, Tex., June 28. DC-6, carrying 55, was only slightly damaged and landed safely. Both occupants of the smaller plane were killed.

FAA increased aviation between Hanoi, Germany and Helsinki, Finland, beginning July 1 to take care of Olympic Games traffic.

Seventy-two million in international money gotten out by FAA and TWA has been granted by CAB, which also made some modifications in the service. The Board also turned down European-American Airlines' application to set up freight routes between U. S. and Europe.

Five U. S. seeping losses are pending in the international shipwreck shipwreck. The ship was in Madrid, Spain, June 30. It is heading to the southwest in Richard B. Johnson, an international distance hotel.

J. B. Drenth, formerly with the Bureau of Internal Revenue, has been named secretary of the Air Transport Assn., succeeding the late Merrill F. Rodden. Drenth also will serve as ATA's assistant general counsel.

Boeing C-97A Starliner's carried record load of 179 tons from Travis AFB, Calif., to Hawaii in 11 hr 52

NEWS DIGEST



PIASECKI DISPLAYS COPTER STYLES

Extensive comparison of Piasecki's helicopter products is shown in the new of a small Navy HUP-5 hovering over the big new USFV YH-21 Wasp, which is now being flight tested. Score is Piasecki's

International Airport. The YH-21, shown as a "bug house" design. The HUP-5 was in a 30 ft. long, 10 ft. wide, 15 ft. in height. Later HUP-5 will cost \$2.

June 22. Gross weight was nearly 30 tons.

Boeing for aircraft is being given by Sen. Ed Brooke. His position: "I see no reason why they cannot be given permission, if limited, operating authority to serve the public, as the special courts have done so successfully, without federal assistance from the government." The law says it is decisions on the part of CAB in the case of Boeing should be made as soon as possible. The longer the part of Boeing and Boeing contract, the greater the danger of establishing a pattern for companies.

Capt. William E. Veenboer, 62, and reception controller, died in San Francisco June 27. He started his military flight in the late 1930s.

Boeing also offered \$2-million profit on an \$57-million USAF housing project at Wright Field as being sold by Ray Paul Schick. He wants to know how much Boeing Construction Co., Shoreline, Wash., got the contract, also why a retired USAF general, George H. Bessley, was named engineer on the project. Schick said the project was in a dangerous location close to a busy road and "an aviation to disaster."

Three Boeing bombers reportedly have been ordered from Boeing's new division of Boeing Airlines Corp. by Canadian Pacific Air for evaluation on the forthcoming Douglas DC-60s.

Financial

Elwell, Inc., Kingston, N. Y., has declared a quarterly dividend of 10 cents on outstanding common stock

June 22. Gross weight was nearly 30 tons.

Northwest Airlines had net loss of \$24,102 for May. Consolidation of flights because of all strike is blamed. Operating revenues during the month were \$1,416,181. The carrier has sold a 20.75-cent quarterly dividend on 4.4% cumulative preference stock, payable Aug. 3 to holders of record on July 15.

Jack & Hewitt, Inc., Cincinnati, has declared a 15-cent dividend on common payable Aug. 1 to holders on July 15. There also will be a 38-cent-a-share dividend paid on 4% cumulative preferred on Oct. 1 to holders of record on Sept. 15.

International

Gloster G.A. 5 two-seat jets wing all-weather fighter craft-labeled as flexible. Down test status when new aircraft controls reportedly didn't work properly. American prototype G.A. 5 is scheduled to fly soon. Production is not being held up because of the setback.

Fokker 8-14 side-by-side jet trainer recently was inspected by Maj. Gen. Craig, USAF Deputy Chief of Staff for Research and Development. Recently the plane also was flown by a member of RAF personnel, including Air Marshal Sir John Bonham, RAF Farnborough. The 34 is slated to go into production soon.

USAF-Europe has ordered 54 million worth of jet engine starters for F-4 Thunderbolt fighters from Ford SAE, Paris. The units presumably are needed to the payable dollar described in Aviation Week June 14, p. 75.



Secrets of Russia's MiG Revealed

What the U. S. Air Force has learned about the Russian-built MiG-15 in Korea long has been cloaked in military secrecy. Now the secrecy has been lifted. Aviation Week presents exclusively, on this and the following pages, the first official Air Force evaluation of this Soviet-built fighter, based on captured aircraft.

By Ben S. Lee

Russia's MiG-15 jet fighter has a top speed of 554 knots.

Its rate of climb is a sensational 10,400 ft./min. at sea level.

These facts, and other authentic details about the speedy little Russian plane which is waging war with USAF's best—the North American F-86 Sabre—about daily over Korea have been gathered by Aviation Week from an official USAF evaluation of a captured MiG-15 and an Russian-built Nene-type turbojet engine.

The analysis was completed for the USAF by engineers of Pratt & Whitney Aircraft division, United Aircraft Corp., at East Hartford, Conn.; USAF tech-

nical specialists at Wright-Patterson AFB, Ohio; Cornell Aeronautical Laboratory at Ithaca, N. Y.; and several other government-sponsored research agencies.

More Thrust—There are three versions of the Russian-built MiG-15 in operation against United Nations forces in Korea. In comparison the MiGs are the same, but those of a later model have been reinforced through better engine development by about 1,000 lb. Two are day fighter types and the third incorporates both the night and all-weather specialties.

Three later MiG-15 aircraft are powered by Russian versions of the original British Rolls-Royce "Nene" which developed 5,000 lb. thrust. Russian en-

gines have managed to squeeze as much as 1,000 lb. thrust from the late British engine for a total of 6,000 lb. thrust, dry, at sea level. With water injection, maximum thrust is upped to 6,750 lb.

The MiG-15, with which this analysis is concerned, was built in 1946 at Zabud, U. Karlyphov. The Russian "copy" of the British engine has been redesigned by the Soviet manufacturer as model RD-45. More powerful versions of the latest engine have been reported operating over the Yalu.

Mechanically, research experts reasoned again, construction of all engine parts, with the exception of turbine blade attachments, are of Nene origin. And, they noted, Soviets are capable of carrying to successful conclusion by native talents and modern NEW developments in the field of gas turbine engines.

Quality Excellent—Further indication of how expert the U. S. engineers are in their report that in Russia on gathering and production techniques is an added comment from a top USAF spokesman that, "Soviet workmanship reflected in fabrication of MiG-15

turbine engine parts is high, of excellent quality, and in many instances comparable to American standards and practices."

In 1948, both Rolls-Royce and Pratt & Whitney produced similar versions of the Nene, designating them Tyne and J-46. Both of these engines have, according to previously released ratings, a maximum dry thrust of 6,250 lb. The RD-45 engine closely approximates the U. S. and British advanced development on the original Nene, but the execution of development has been markedly different. This is representative of a separate approach and is obviously the result of independent Soviet work.

Russian development of the Nene, U. S. engineering analysis revealed, was able to obtain a 15% greater rate for combustion chamber throughput and the turbine blades are longer and of wider chord. Examination also revealed that the fuel supply rate of the Russian powerplant is 20% greater than earlier components of the J-46, the original Pratt & Whitney version of the Nene. Russian engineers were able to accomplish the redesign of the original gas passages with no increase in the 9-in. overall diameter of the original British engine.

Materials Swiche—Materials used in the Russian powerplant are similar to those used in the Rolls-Royce Tyne and Pratt & Whitney J-46. The turbine blades are made of a stainless steel alloy known technically as Nimonic 80, while the burner liner and end vane are of Nimonic 75. The over-vent assemblies are fabricated of titanium-impregnated stainless steel in both the inner and outer rings. And additional use of this material in bearings and turbine blades makes practical an engine operating temperature at turbine inlet of 1,570-1,600° F.

Ambush of the Russian powerplant combustion chamber, Air Force officials explain, shows that the Soviets combined a substantial amount of active initiative along with their known procedures in depletion and saving. Examination of the construction of this combustion, it was added, reveals that the Soviets have overcome a design problem which until recently had been virtually an insurmountable obstacle for the British and the U. S.

The Russian innovation is the solution of an additional ring of perforation set off at the pressure zone of the combustion chamber for increased dilution of air.

Walloping Testimony—Further, they said, section of turbocharger rings as the last one in position located in the hot zone of the combustion chamber, an increase in the speed of rotation as the hot zone and last turbine, as well as an increased duplex fuel meter.

Photographic Three View . . .



Official AF Model of MiG-15

Top speed: 554 knots (672 mph). Rate of climb: 10,400 ft./min. at sea level.

Powerplant: Russian RD-45, a development of the British Nene, rated at 6,000 lb. thrust, dry, at sea level; 6,750 lb. with water injection. Fuel consumption: 1.14 lb./lb. thrust/hr.

Empty weight: about 12,100 lb. (F-86A weight has been quoted at 16,500 lb.).

Wingspan: 33 ft., with 42 deg. sweepback. Fuel capacity: 550 gal., including wing tanks. Armament: two 23-mm. and one 37-mm. automatic cannon.



OFFICIAL: Air Force star's version of the MiG-15.

are certainly illustrative of Soviet capabilities in the field of development in jet engines.

Analysis of Soviet welding techniques and practices, the report stated, showed that the laboratories were particularly capable in resistance welding. Furthermore, it noted an "impressive quality of joinability obtained in welding these thicknesses."

Weight of the Soviet powerplant is approximately 3,000 lb. Weight of the Post & Whitney J48 (Aviation Week Feb. 28, 1951, p. 48) is approximately the same. The original Soviet turbojet engine weighed 1,715 lb.

Specific fuel consumption of the Russian jet is 114 lb. per pound of thrust per hour. The report stated that the engine did not incorporate shrouding. However, it was noted that the engine's turbine diameter and length of exhaust tube to allow a static afterburner which would boost thrust 1,000 lb.

Combat Radio-Intelligence officers at the Air Force told Aviation Week previously (June 18, 1951, p. 16) that the MiG-15 engine is capable of producing about 25% more thrust than it has produced to date. The current report leaves out this claim.

[Editor's note: Some speculation as to actual quantities has given rise to a report that the latest engine version of the MiG-15 results in a considerably increased overall range and radius. Range is determined primarily by aircraft configuration. In a more powerful Russian fighter the world men only that the plane would be able to obtain its maximum range at higher altitudes.]

In strength, design, and adequately

performance, it is apparent that advantage gained in performance of one feature is usually gained only at cost in another desirable feature.

For example, the Russian government apparently has far less regard for the safety and isolation of its pilot personnel than it does for fighter performance. During World War II, of some 11,000 Red P-79 Aceshows built, more than half were sent to Korea at that time on only under instruction terms. The Soviets purposely discarded some pilots, reduced the number of reserve gun and removed considerable maintenance through necessity by the U.S. Air Force pilot safety and security. Beyond was a test series of more than a ton and a half, and the U.S. Air Force had begun to consider a second-stage fighter more than a month for anything the Germans could get up on the Eastern front against the Reds.

Weight Comparison: This is true to do of Red MiG-15 little more than. While certainly the same in dimensions and power in one North American F-86A and U.S. fighter, performance in, many respects the MiG-15 still outperforms the F-86. This is true because the U.S. fighter is constructed with "upside" down construction by the military for pilot safety and convenience in flight to the tune of almost two tons. The MiG-15 weighs approximately 12,500 lb. while the F-86A weighs 10,500 lb.

The problem of necessary weight in performance in U.S. aircraft is faulty. This nation rightly values the lives of its fighting men highly, and put them in going to have to be a fine

down somewhere on itself) necessary concentration, a Defense spokesman says.

"We are making our plans to safe the pilot that we are killing him," he explained. In battle time, speed and performance is the thing. In the air, combat is almost a one-shot affair. With its combat rates of climb as ready putting the 1,400-mph, mark, conventional aircraft are virtually useless. At these speeds, a hit is made more will send the pilot into.

In general configuration the MiG is slightly smaller both in span and length than the F-86. Span of the MiG is 37 ft., against 37 ft. 10 in. for the F-86.

Paul Capony-like, the ground resistance only heavy F-86, with the much lighter weight of the MiG in comparison to the F-86, performance at altitude is superior. The weight differential gives the MiG some advantage in climb, cruise and maneuverability. Vietnam attacking from Korea report that MiG pilots can "burn up the sky" and hit about 550 knots in level flight at sea level.

These same reports it also claims at about 9,500 ft. per sec. They report it can climb to 50,000 ft. in under 6 min and that its performance above that altitude is phenomenal to about 50,000 ft., at 40,000 ft.

Early models of the MiG-15 had a fuel capacity of approximately 150 gal., although pilots returning from Korea report more later versions equipped with disposable external wing tanks, which should considerably increase their range. Present versions are equipped with fuel systems and external tanks for carrying either bombs or fuel.

General

"Steel," the Air Force report said, "is used in the MiG at every point where highly concentrated loads are encountered." Carry-through structures are used almost everywhere an attached. The beams were built up of steel caps and an aluminum web. Some construction is used in the tail assembly.

The 1948 engine, although it is described as a "jet engine," has a compressed monocoque at full open position, it has no position for augmentation of the basic engine performance. The engine had a nacelle.

The exhaust system for the leading gear and bores in hydraulic. A pneumatic system supplied by air bottles is provided to extend the flap and landing gear in the event of total hydraulic pressure. The underside of the wing panel includes attachment for moving external fuel load or bombs. Armament carried on the MiG-15 is two 20-mm. and one 37-mm. cannon.

There is no provision for installation

of IFF in other radar equipment in the 1948 version of the MiG, although later planes now flying do incorporate a more substantial quality of electronic means.

Engine during development was possible a split duct in the rear intake and engine port the pilot compartment. Immediately aft of the cockpit, and slightly forward of the front wing section, the two ducts split, forming two separate ducts which continue aft and slope into the pylon chamber.

The total duct was substantially for ward of the pylon chamber results in a decrease in overall damping loss.

Design Analysis

Wing Wash-Wing span is 37 ft. The average loaded section thickness is approximately 115%. The wing in plan form is swept back 42 deg. It incorporates conventional control surfaces.

There is no external aerodynamic control balance installed on the ailerons. The aileron ailerons balance is incorporated in the control arm. It does severely limit the thickness of the aileron and therefore the effectiveness of the ailerons.

There are two stall fences, approximately 4 in. high, formed by joining two sheets of aluminum together, is staked on the upper surface of each wing parallel to the line of flight. The fences extend from the wing leading edge to the flap hinge line.

Horizontal stabilizer: The horizontal tail surface, spanning 14 ft. 10 in., also is swept 42 deg. It incorporates a serrated plate at the forward attachment point of the horizontal stabilizer. The plate is a general adjustment of the angle of incidence. A third plate, acting as a cam balance, is located at the bottom of the stabilizer assembly. An additional rear balance weight is located at the upper tip of the stabilizer. This balance weight is enclosed in a streamlined jacket fixed into the vertical stabilizer.

And third, the vertical stabilizer is a general adjustment of the angle of incidence. A third plate, acting as a cam balance, is located at the bottom of the stabilizer assembly. An additional rear balance weight is located at the upper tip of the stabilizer. This balance weight is enclosed in a streamlined jacket fixed into the vertical stabilizer.

Stabilizer: The vertical stabilizer is a general adjustment of the angle of incidence. A third plate, acting as a cam balance, is located at the bottom of the stabilizer assembly. An additional rear balance weight is located at the upper tip of the stabilizer. This balance weight is enclosed in a streamlined jacket fixed into the vertical stabilizer.

Structural Design

Portion of the MiG-15 is of conventional, semi-monocoque construction with stressed metal skin and through



SIDE VIEW of the official Air Force model of Russia's high-performance MiG-15.

out. The sections are built of pressed aluminum, faceted, extruded, stamped and aluminum skin. The nose and section, containing the pilot's compartment and fuel cells, comprise the forward assembly of the fuselage. This assembly ends just at the attachment of the rear wing spar with the side of the fuselage.

At this point, a stiff carry-through structure for the wing is located. The carry-through structure is in the form of an "I" section having two steel caps joined by a web consisting of two aluminum plates bolted and riveted to the caps. The aft section of the fuselage bolts to this structure, using the same fittings as the wing to fuselage connection.

This permits the rear portion of the fuselage to be easily removed for access to the engine. The wings are attached to the carry-through structure by a two-piece fastening arrangement.

The Wing-The wing is installed in a single panel with the main brack at the side of the fuselage. A skin brack is located at the outboard end of the leading flap. The wing outboard of the leading flap has two spars running at constant chord percentage span. The aft spar continues to the side of the fuselage and the front spar to the leading gear hinge point.

From this point the front spar angles forward to allow space for the fuel cell. A third spar runs diagonally from a point on the front spar just outboard of the leading gear and perpendicular to the center line of the fuselage.

The forward and aft spars are built up of "I" section aluminum alloy spars, attaching extrusions for the upper and lower caps. The diagonal spar is similar in construction to the carry-through structure previously described, and transmits the leading load to that structure.

Two main balancers of approximately 60 lb. each are located in the leading edge near each wing tip. These are used to avoid a critical flutter frequency within the allowable range of flight speed of the airplane, increasing the speed at which flutter will develop.

Vertical Fin-The vertical fin is of batten construction, the rear spar designed to be the primary load carrying member. Loads from the spar are attached by the fuselage assembly through a heavy steel frame placed in the fuselage on a line parallel to the rear spar of the vertical fin.

The fin is fabricated of pressed aluminum skin and stringers with the skin flush riveted to the structural members. The lower portion of the rear spar is a steel "I" beam with web lightening holes. The section of the vertical fin above the structural member is attached to the lower section with bolts.

Stabilizer-The horizontal stabilizer is of monocoque-type construction and partially all skin and leading edge are taken up by the spar and transmitted to the steel carry-through structure located in the rear fuselage. Forward loads are taken up by the spar and forward all-weather joint.

Powerplant

The Russian-developed MiG-15 engine, based on the design of Reddy Boyce Sauer, is known as the RD-45 engine, the 1948 version of which developed 5,000 lb. thrust. The engine is a conventional turbojet, incorporating:

- Single-stage double-entry centrifugal compressor.
 - Nine straight-through two-type combustion chambers.
 - A single-stage axial-flow section turbine.
 - Exhaust system.
- The compressor consists of a 25.5 in.

F-94C Nearly All-Automatic Interceptor



STRAIGHTENING: F-94C Starfire has a wing load 41,000 lb., and flies



14 ROCKETS from nose. Photo shows rocket door open, revealing firing tubes



TOP VIEW shows leading edge doors. Tail protrude is lowest bit of radars

- New warplane largely flown by avionics aids.
- Pilot's principal job is to get plane in the air.

Lockheed's latest fighter-interceptor for the Air Force, the F-94C Starfire, is the newest approach yet to an all-automatic warplane.

Designed as an all-weather jet interceptor with the specific mission of leading out enemy bombers, the Starfire is armed with 24 rockets—2.75-in. caliber—and flown largely by avionics aids.

The new interceptor features a straight-wing layout and a swept horizontal tail. Tailzone tension of the wing—made possible at least in part by Lockheed's use of integrally ribbed skin—gives excellent high-speed characteristics.

► **Avionics.** Crew—Pilot, instrument and 1,200 lb. of avionics gear comprise the core of the Starfire. Much of the pilot is to get the plane off the ground and bring it to a velocity to target area by ground radar, and then he switches on the automatic intercept component.

This collection of radar sets locks on the target tracks it, closes the distance gap between the Starfire and its victim, aims the plane and then opens fire with the rockets. It is conceivable that the instrument and pilot won't know there is a target until the enemy borders, and its gap disappears from the radar scope.

Armament of the Starfire is a new approach. Twenty-four solid rockets are clustered in no number around the nose radome. During flight, the radome of the firing tubes are concealed behind a sliding sleeve, but as the firing process, this sleeve, wings open like a fraction of a second to let the rockets out, and then closes the opening again.

Additional rockets can be stored in wingtip pods, as in the Northrop F-95D. Postwar—Thrust to drive the new Starfire comes from the big Pratt & Whitney J48-P-5 fitted with an aluminum State-level thrust of the engine is 6,250 lb. without afterburning, with the rocket operating, thrust of the engine increases to something around 8,700 lb.

Leading edges of the wing are integrally ribbed—skin and stiffening ribs are cut out of one piece of aluminum alloy.

Included in the 1,200 lb. of avionics equipment are the new Westinghouse automatic pilot and Sperry's Zero Radar Sight Director. The plane is



LOCKHEED F-94C is powered by Pratt & Whitney J48 Turbo-Wing jet engine with a basic rating of 6,250 lb. thrust without afterburning. With afterburner thrust is automatically increased at more than 8,700 lb.

equipped with ILS for low-visibility landings at all levels of automation.

The powered cockpit is equipped with ejection seats and a precision energy. Combat depends on the Hawk three Standard air intercept mode.

One of the reasons for the strong reputation of the facilities around the tail section is the use of a ribbon drive. This is to be used in short-field landings.

► **Rate and Performance.** This recent test at the evaluation of the ability

F-94C performs a seven feet longer and about 4,000 lb. heavier than its ancestor.

At takeoff, the F-94C weighs over 20,000 lb. It is 41 ft. 5 in. long and the straight-taper wing spans 37 ft. 6 in. Top speed altitude is in the neighborhood of 43,000 ft. 7 in.

Performance tests are underway, but the Air Force makes the great an assessment of "over 600 mph" speed of the two series comparison, a driven by specific features through consistent shifting. Forward component in the low-pressure unit, air compressor along the high-pressure jet.

This arrangement is intended to give easy starting, low fuel consumption, but at the expense of a complicated production process.

In Europe, with British practice of more than 100 mph, the Olympus turbines only 40 in. across and mounting this diameter fairly compact. Length from intake to exhaust is 124 in., weight is 3,175 lb.

It is not in production, but the low-level area of burner installation in separate aircraft through the main turbine advantages offered by the pod component of burning products from the wing adopted by some U.S. manufacturers.

It is an open secret in British aircraft circles that the Olympus will be the jet for the Avon design, besides.

The Avon prototype is slated to fly in the next few months, but that first jet probably will take the air with Rolls-Royce Avon jets.

► **Wright.** Wright Aircraft Co., under its agreement with Bristol, has led the Olympus on the test stand in its Wood Ridge, N. J., facilities for some time now and is reported to have acquired one more than 9,000 lb. thrust from the engine. Indications are, too, that the Olympus' very high acceleration has been substantiated at Wright test run.

If Wright builds a version of the Olympus, the chances are that the base configurations will be selected but the

10,000-lb.-Thrust British Jet Engine

Bristol's twin-engine compressor in use—the Olympus—has been developed as Britain's first jet engine in the 10,000-lb.-plus thrust category. The engine classed the prevalent in the world's most powerful and most economical jet at this stage of development.

Two series version carried a rating of 9,750 lb. thrust. Avon's Westinghouse predicted May 7, 1955, the Olympus prototype would be in the 9,500-10,000-lb. range.

This screw-driven compressor has been cleared for flight test and a pair of them will be tested about a converted English Electric Canberra aircraft. Engineers say that the Canberra can't take the full power of the two Olympus, hence Bristol is aiming to put two of the units on the fighter Hawk IIIs, S.A. 5 jet launchers.

► **High acceleration.** The engine is expected to come up with a fuel rate of 766 lb./hr. thrust. Test bed runs have demonstrated high acceleration—7 g's, from idling to full power. Each of the two series comparison, a driven by specific features through consistent shifting. Forward component in the low-pressure unit, air compressor along the high-pressure jet.

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Heavy Press Plan Looks to Europe

By Alexander McNulty

Dayton—Lack of interest by qualified U. S. men and steel industry industry people in both to build and manage USAF's heavy duty and extrusion press program now means that most of the remaining castings needed will be placed in Europe, observers here noted (See USAF's Big Money on "Big Sequence," p. 35).

The forecast followed a two-day session held here at Production and Resources Institute of AMEC, under sponsorship of National Productivity Administration, to discuss production availability for castings of 25 tons and over.

► **Four Turnout.** Of 160 foundry men, many retired, representatives of 12 foundries up. Questionnaires showed that six of these companies made castings up to 30 tons in size, four others up to 25 tons, one up to 30 tons, and one up to 130 tons.

On exhibit for them to examine were 51 blueprints from which 125 castings are to be delivered, 44 ranging in size from 25 tons to 175 tons.

Questionnaires indicated by their heavy press builders—Larsen Construction Co., New York; Baldwin-Lucas Hamilton Co., Philadelphia; and R. W. Han Co., Canton, Ohio. Other heavy press builders have already made arrangements for their castings to be produced in this country.

As a result of the Dayton conference at least two of the three press builders are expected to go ahead on questionnaires recently provided them through a European source.

For its study the mission provided castings capacities in 35 companies in France, England, Germany and Italy, all of which have had experience in producing castings over 15 tons in size. (The third company, BSA, is conducting other operations with U. S. companies.)

► **Eight Months.** Delivery—The explicit way, means was held that some of the European foundries could not finish machine castings ready for shipment within eight months after first orders were placed. An additional two weeks is estimated to be the required time for shipping.

The exploratory mission was organized on the basis of information previously received that American foundries capable of making castings of 25 tons and more had their capacity loaded well into the future. However, after the mission was sent to Europe, the question was raised in NPA is to whether the American heavy industry had been given such an opportunity to bid. This question brought about the agreement of the conference at Wright Field last week for the benefit of the U. S. steel makers.

engine will be further developed and refined, probably coming out as a new jet with a thrust for above the 30,000 lb thrust attributed to the J55, the J59, which has been closed for flight test.

There has not been a Wright passenger contract renewed for the C-119, but with the best on the higher-power jets, Wright can be expected to push an experimental, higher thrust version of the engine for the very near future.

Robot Tack Clerk Readies AA for Jets

A robot, the Magister Receptor, has been in control of ticket information at American Airlines in New York for several weeks now.

While the Receptor for its "robot representative," the push button system (as it appears on ticket sales counters) has not been in evidence to the public, it has been doing a full-fledged job backstage at AA's vast ticket sales and reservations control center at LaGuardia Field.

Robot clerks taking reservations by telephone have found their work expedited and made more accurate, with time-consuming telephone clerks to other offices for ticket availability information cut way down.

In order to make a test of the new system, an American Wings engineer called the AA office and asked for ticket seats on a morning flight from Chicago to Indianapolis five days from the time of the request. He got a confirmation for this five-day advance booking for a "Shoreland" reservation. But then, the clerk had to get on another wire and consult other personnel, taking as long as four to five minutes in contacting other departments.

The Receptor has been in the making for eight years and cost \$4 million in development. It is the first commercial application of a digital computer. American feels that it makes the center for larger sales leads and faster handling that will be needed to keep pace with the jet age.

CPA Gets New Routes

A franchise from Northern Ontario and Quebec touching Toronto and Montreal has been granted Canadian Pacific Airlines by Canadian Pacific Transport Board, Ottawa, over the profits of Trans-Canada Air Lines. This marks the first time that a carrier other than TCA has been given a franchise to operate between Canadian cities by air. The new service permits CPA to extend its Montreal-Rome service to Eastern in the northern Ontario gold-mining area, and from Eastern to Toronto.

EAL Action Spoils ATA Plans

Just as the Air Transport Association is preparing one of its first new cooperative efforts in years—a joint airlines publicity program—an extremely resistant has threatened to spoil the cooperation. As a result, the ATA's Eastern Air Lines proposal to E. V. Rickenbacker has announced he will withdraw Eastern from the association. Apparent reason is that the majority of the association's directors refuse to approve Rickenbacker's nomination for presidency of the association—Robert Rosenfeld. Rickenbacker told the ATA directors that Rosenfeld was not the man for the job. The directors should not merge on their commitment.

Rosenfeld had been due to arrive to his executive vice presidency of ATA last week (July 15) for a term of absence, but he required a short extension of his leave, and repeatedly conditioned his return on becoming ATA's chief executive. When ATA Eastern Line counsel, Rickenbacker, claims that the ATA directors had previously committed themselves to accept Rosenfeld, Rosenfeld actually argued in December that the House to become ATA executive vice president. Last year at the request of President Tamm, ATA granted Rosenfeld a year's leave of absence to be chairman of the Civil Service Commission until this July 1.

Some Opponents of the ATA split occurred two weeks ago at the director's meeting starting with discussion of Rosenfeld's bid for executive general of the association and his request for a short extension of his leave of absence beyond this June 30.

One faction of the ATA directors is opposed to Rosenfeld. A director who opposes Rosenfeld is John W. West. West is a director of the ATA and has been voted against joining him the top job of ATA because they know the association can't function unless all directors support its management.

That apparently is the case since the majority of directors voted against Rosenfeld's proposal.

Rosenfeld's position is that Rickenbacker gives himself with his withdrawal plan to resign Eastern from ATA. EAL will still be a member until the end of the year. Article 15 of the ATA bylaws states that any member who withdraws from the association is subject to a vote by the members.

If Eastern does withdraw, it will increase the company's annual expenses most airline executives agree. The ATA budget of about \$1 million a year is shared among several airlines for the joint benefit of the members. Eastern personally believed its share of the ATA budget was well worthwhile as

the airline has been active in the association since joining in 1935. Rickenbacker's public announcement of two weeks ago based his decision on a matter of principle—feeling carrying out what he saw was a stupid or unhelpful position to Rosenfeld several years ago.

While Eastern would lose technical services, it still would participate in other agency organizations operated generally by ATA members. American General House, American Radio, Inc. and Air Cargo, Inc.

The Eastern withdrawal incident occurred because, as one director put it, "the membership was not of all airlines for Rosenfeld to be president." Rosenfeld has argued and will continue as Civil Service chairman. But ATA now faces the possibility of being without one of its most prominent members. This is just the time the ATA needs prominent members, because of the cost of the planned joint airlines publicity campaign.

ATA President—ATA has approved an annual budget of just under \$1 million. It has long been known that the airline was losing a big chunk of business by not sponsoring a joint publicity program. The year-end New York Airport station has made joint publicity and association a must. The Association of American Airlines spends about \$5 million a year on publicity.

Problems is that the airlines have some serious economic financial problems for such a project. The problem is the money situation. The airlines are in a state of financial distress and are no longer required the intense concentration of a special order operation. Exact timing and range of aircraft use now seem unlikely by all lower part of the year. Only Gilfillan has developed a reliable, full-time range-schedule in T.L.

The National Airline of Motor Bus Operation since great up to 1930-3000 aircraft. For public use, but Combined and a low level were increasing the financial burden they tried to switch it to a private domain but, as one NAAO official explained, "some airlines are not so bold as to go as far as we are." So the bus operation got along like the airline has with no joint publicity.

Now the airlines are going to try a joint publicity program. United Air Lines president W. A. Paffenbarger is leading a committee to assemble cost data of various advertising and public relations programs.

Whether the Airline Air Lines bill will do the position is debatable. But Rickenbacker is a member of the National Air Transport Coordinating Committee. His firm has been in some of the public force around some airports. It is difficult to conceive him pulling out of that position when ATA financially takes it over.

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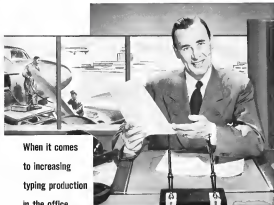
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AERONAUTICAL ENGINEERING



THIRD DEUX-PONTES, giant Breguet transport, is under the wings of Air France, a designated Type 704. Standard modified transport version for Air France will be called Type 703 Freeway.



REAR DOORS of Deux-Ponts swing wide for delivery of 106,000 LBS. components in its lower deck. Deux-Ponts, built at left in. Access to both upper and lower decks of the right one shown in second photo, it left one shown ahead against wall for cargo storage in other deck. This picture was taken in workshop.



Hand Labor Builds Breguet Deux-Ponts

Big passenger-cargo transport will carry 40 on top deck, 60 below or can be used as an all-cargo carrier.

The first factories of M. Louis Breguet represent a new section of French aircraft design practice. Their products range from a little airplane to the gigantic Type 703 Freeway—two-deck transport development of the type 70 Deux-Ponts which qualifies on at least one score as the world's largest aircraft because of its 100-plus capacity. Along the path was there have been a colonial helicopter and a small side fighter and low-winged flying boat. And in the future are a conventional and guided missiles with concrete wings.

Private Business-Breguet's firm—the Ateliers d'Aviation Louis Breguet—is one of two huge air manufacturers in France (the other is Avions Marcel Dassault, maker of the Ouragan and Mystere jet fighters).

Ferré Breguet, one of the firm's top executives and son of the founder, took an American Ways route through the company's headquarters plant at Villecosnon.

This factory is currently winding up the first production order for the Deux-Ponts 703 in addition to working on

new designs and the making of at least one military type.

There are few big machine tools in the Villecosnon plant, and an automatic ones. The reason: Labor is so cheap that hand labor, even for complicated and large assemblies, is cheaper than machinery. Breguet and his firm put considerable effort on a Douglas or Lockheed type of operation, because it would be prohibitively expensive.

Largest Citroën-Breguet's biggest effort in every sense of the word is the Type 70 Deux-Ponts, a four-engine, two-deck, passenger and freight transport. With capacity for 48 passengers on the upper deck to first-class comfort and 60 towards taking the lower deck

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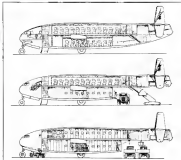
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FEATURES of Bisquit Type 76 include side and rear loading (above) and three...



ARRANGEMENTS—All-passenger (top), passenger-cargo (center), all-cargo (bottom).

in low-wingman arm, the Dornier/Dornier comes with passengers than any other commercial transport design.

Original concept of the craft was developed by a French Air Ministry decision of 1964 which called for a place to carry four C-130 trucks, two on an upper deck and two on a lower.

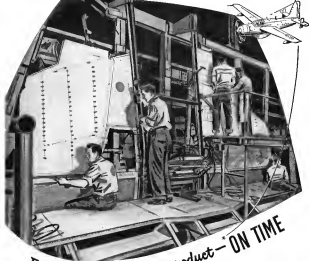
Plans of these four transport are being built, although Bisquit has material for 21. Each is scheduled for Air France, and the remaining three become the property of Air Algérie. With fabrication well under way on the Dornier/Dornier, Bisquit feels it will make a profit at current selling price—\$1.6 million per copy.

First flight—The prototype Bisquit 761 made its first flight in February, 1969. Preliminary on this first ship was SNF024-14 R. per person cargo

A Certificat de Navigabilité (CDN, which corresponds to our Approved Type Certificate) was granted for the craft with a gross weight of 55,500 lb. specified. The first three production aircraft were designated the Type 761 & then, in sequence with Part 8, Military R2800/100 or R31 series piston engines, which develop more than 2,000 hp at takeoff. The first of these has finished its test program and has received its CDN for a gross weight of 59,500 lb.

Second ship of these first three was delivered in March, 1969, to Air Algérie and is on exhibition trials.

Some changes were made in the arrangement. 12 engines which were called the Type 761 Provisor. These could have been strengthened and their wingman increased to permit the use



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This center is one of the nation's largest electronics shops for electronic instruments. It was developed by Lockheed to provide the latest in that science of automatic controls for such Lockheed planes as the F-94, the U-2, and the F-104. Every Component value constantly, and develop new models of the P-3 Navy patrol bomber for anti-submarine warfare.

Such instruments as Westinghouse, Hughes, General Electric, RCA, Raytheon, Western Electric, Sperry and many others having advanced electronic developments in Lockheed for practical applications.

DESIGN ENGINEER

Lockheed's approach to electronics differs considerably from many other aircraft manufacturers. At Lockheed the emphasis is on the application, not the manufacture, of electronics. That's because Lockheed begins the design of an advanced plane with the specific mission of the plane in mind. Knowing what the plane must do, Lockheed wants to be free to analyze all products of all manufacturers in order to obtain the most advanced electronic design needed to successfully do the mission.

Lockheed does more than supply existing electronics. Often, no device is available to perform a specific job. At such a time, Lockheed scientists produce the all-important idea, frequently supplying the basic design, for a new product. Then they turn it over to an electronics company for manufacture.

FLYING DESIGN

America's first All Weather Interceptor, the Lockheed F-94, is a current result of Lockheed's policy. Not being a manufacturer of electronics, noncompetitive Lockheed can work closely with companies who are, as well as the U.S. Air Service. As a result the F-94 was electronically at least two years ahead of competitive aircraft.

This leadership is a principal reason why Lockheed is attracting so many top experts in electronics.

of larger diameter propellers. Engines for them are to be the P&W J-3500 C-20, which give more than 2,100 hp at 10,000 ft without water injection, and step this rating up to 2,600 hp with water.

► **Further Tests**—The first Type 751 completed its tests and was returned to the C-119 for a trip weight of about 105,000 lb. The aircraft was largely constructed of the perfect performance of the type.

Second Type 751 has completed over 100 h of flight with Air France since the spring of 1952. Detail parts between and competent accuracy of this plane is done at one site at two different plants. These parts are subject to an inspection building for final assembly and maintenance of equipment. This building was assembled specifically for the Type 751 series.

Major difference between production craft will be in the pilot's cockpit. Air France will use a four-man crew with pilot, pilot/flight engineer and navigator/instructor. An engine crew four man crew, splitting the duties of cockpit and engine.

Both Type 751 will use the heavy engine engine, the autopilot will be a Sperry licensed, French built type.

► **Versatility**—The two-deck arrangement of the Type 751 series makes for considerable versatility. Loading can be in combination of berths, sleep cots or bunk passenger and freight. The upper deck can be equipped as a variety of loading arrangements. Two-deck accommodations, for example, are set up five abreast in two styles, one for 79 and the other for 69 passengers (but one with only four). Toward sides are about 12 in wide and are spaced 19 in centers for 79 passengers and 55 in, center for 69 passengers.

First-class style is roomier. Forty-eight passengers are housed in 11 rows of four reclining seats abreast, or in some rows of Sleepcote accommodations. These seats are also about 21 in wide, in the 49-passenger version, seat spacing is in 39 in. centers and is in contrast to 52 in spacing for the Sleepcote arrangement.

The upper-deck also has a kitchen for serving 16 seats and corresponding arrangement of direct and indirect ventilation accommodations are installed, and there is a station for the stewardess.

► **Lower Deck**—Volume of the lower compartment is about 2,500 cu ft. Size of freight which can be loaded is limited to an overall length of 41.7 ft and width of 12.5 ft. Maximum permissible deck loading is given as 541 psi.

There are movable seats on the lower deck for the accommodation of 48 coach passengers. In this version, there is baggage space of about 42 cu ft. ahead of the passenger compartment.

Seats on the lower deck are upholstered



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Valve Talk

by Wm. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Manager, Aviation Motors Area,



When I wrote about Bob Whittaker producing valves with the help of three part-time workers, I didn't realize just how great a contrast it was to the 900 men specialized job shop that now comprises the Whittaker Production Department.

This unique operation consumes over 67,000 parts daily, turns out 882,000 worth of valves each day, and makes most companies that produce at such a rate, these figures represent the production of some 100 different types of valves.

Since each valve order is different in type and number, the problem of keeping such varied production in free-flow with day-to-day changes in order under manufacture is a 24-hour-a-day challenge to the men in Whittaker's Verrier (C) plant.

Control centers check hourly on the progress of all jobs. Every 24 hours a recapitulation is posted on a master card index system. With this continuous watch, another job can be moved quickly into the bench when a trouble flag goes up at any stage.

Further complicating the process is the fact that it is necessary to utilize the full production output of 56 different vendors and a score of processors to maintain a smooth flow of parts from the raw material stage into completed valve assemblies in the rate required by the major aircraft and power plant companies throughout the nation.

All this starts when Whittaker's valve design engineers coordinate their developments with tooling and production engineers to insure operation simplicity and facilitate construction, processing and assembly.

Valve parts already in production, for instance, are used as far as possible in new designs to eliminate the need for new tooling. Production help is provided for designing prototype tooling for ready conversion to production tooling.

Current costs for new tools, replacement, repairs, storage and handling exceed \$50,000 a month. A big share of this expenditure goes into the development of tools that will double and triple normal productivity while virtually eliminating parts spoilage.

Other evidences of this constant search for efficiency in Whittaker's Verrier plant—circular form tools on which cutting edges can be sharpened some of these, lathe runs made from better plate, carbide valve tips or solid relief steel blanks for quick replacement of worn or damaged tips, several types of conical-developer broaches, utilization of "removable" extension sections to hold sets pins for lathe chucks, specially designed equipment for quick and highly-accurate test readings, micro-finishing by tool control instead of processing, honing and grinding.

In various parts of the plant you'll come across Rube Goldberg-type rigs for new tools and testing devices. The brainchildren of Whittaker production experts, these novel contraptions represent a constant search for better productive methods.

Production efficiency isn't left solely to tools and testing, however. 116 inspectors, quality expeditors and analytical engineers, keep the manufacturing wheels turning smoothly and insure the finished quality for which Whittaker is noted.

There is a tool maker's expression—"dead nuts"—for anything that's exact and accurate. It can be well applied to Whittaker production.

ble rear seats in addition. They seat two and have two seats only at either side by a simple man-overboard method, these seats can be swung up to lie flat against the cabin wall, leaving the narrow aisleways free for flight. A railroad-type baggage rack is shown. Toilet and lavatory space is also provided on the lower deck.

Performance—Wingspan of the Primrose is 84 ft., the same as the Boeing Stearman. Overall length is 95 ft. and height is 51 ft. 4 in.

Maximum lift-off weight is 112,000 lb. Of this, 69,708 lb. represents the empty weight of the craft and 23,900 lb. takes care of the passengers. Fuel weight is 16,500 lb., and the remainder of about 79,500 lb. is equipment.

Cruising speed is 248 mph. at an altitude of about 9,500 ft., using 100% of take-off power.

With water injection for the P&W C41B engines, lift-off can be 4,023 ft. in maximum lift-off weight of 116,000 lb. for an level standard conditions.

Practical range is on the order of 1,300 mi. with reserves computed according to ATA standards. Maximum load can be carried for a distance of about 1,450 mi. with ATA standards applying.

Design Idea—The big Dead-Ends Project is Budget's major effort, but there are other projects of interest either in design or construction phase at the moment.

One interesting proposal is a four-engine transport which would combine turbojets and turbojets power. Examples include Rolls-Royce Dart turbojets mounted outboard and two Rolls-Royce Avon turbojet engines mounted inboard.

Thus a four-engine could take off on all four and cruise and hold on all four with four shut down. One advantage of the four is that engines could be the same as Air France's Caravelles (Avon jets) and Vespulas (Darts) in order.

The French Air Ministry showed some interest in the different transport but for France turned it down as being too radical.

Budget's interest in helicopter dates ever back to the early flights made by Louis Bréguet, founder of the firm. Their models of a current chapter have been built at Budget, these days five, including the pilot. But there is no interest in the configuration any more, says Bréguet.

Instead, because the Sikorski S-55 and the French firm is now busy making drawing changes. Production will probably be made to drawings from Westland Aircraft, Ltd., British firm which also has a Sikorski license. Bréguet gives it that Westland's mode of the drawings needed materials and techniques with



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DAES 10407

which the French are most familiar. Designed as seating units for the Type 50 Valais, a helicopter anti-aircraft fighter.

Two are being built, but any further money must wait on the new fiscal year which begins July 1.

►Concrete Wings—Recent reports of a pronounced concrete wing for aircraft are less than considerable interest abroad (AVIATION WEEK, Mar. 5, p. 11). The techniques have been developed by Breguet in the past where they feel the best outlook is for guided missiles.

These wings are formed in molds which contain rubber bladders, running continuous. The concrete is poured into bladders and accelerated, reinforcing ribs, and then the bladders are inflated. Pressure in the bladders forms internal hollow sections in the wing and helps to squeeze water out of the concrete. Six feet back can be made as easily as metal.

Concrete, with which the French have shown some interest, is cheap and available. Breguet gave a typical production figure of 15 wings per day from this new process.

The firm is building a glider base—on to surface vessels—with the concrete wings.

►Convertible—Another magnificent design proposal by the Breguet firm is a convertiplane. Now in the drawing stage, the craft would be built around flat wings. The wing is hinged for use as a helicopter rotor and drops through an extreme deflection to provide high lift coefficient. Plans are expected to be able to hover and to land in about 120 ft.

Breguet's plant at Villacoublay was built after 1944 and is one of four for the navy. Other three are a machine tool plant in Paris and subsonic ducts at Toulouse and Bordeaux. The Toulouse plant also is in production on the Type 509 torpedo.

Villacoublay is primarily for building—administration, tests, detail parts and assembly, and final evaluation. A subsonic wind-tunnel with 120 mph speed and a 12 ft square test section is on the premises.

Employment of the company is around 5,000, this is considerably up from the 400 people working there during the early stages of rehabilitation of the French aircraft industry.

New Rotor System

Pratt & Whitney Corp. is working on a rotor system to increase the speed of conventional rotors without any changes in the craft's configuration, according to P&W's latest annual report. The development approach could be fitted to match new air production as it is not much different.



Flowrator installation in jet engine test cell at Allison div. of General Motors gives indication of accuracy testing and piping for use of Fisher & Porter unit.

Flowrator Handles Jet Fuel Safely

An explosion-proof, waste-indicating fuel filter—Flowrator—which shows an average duration of less than 0.125—has been developed by Fisher & Porter Co., Hatfield, Pa. Its stainless steel construction, together with its explosion-proof and remote reading features, makes it capable of handling more corrosive and chemically active fuels than gasoline and the JP series.

The instrument has received Air Force approval and currently is in use in jet engine test stands of the Allison division of General Motors.

John O. Larson, F&P vice president, says that the new Flowrator is able to measure fuel flow rates from 160 to 85,000 lb per hr., and that the accuracy of measurement is better than that of the older glass-bell flow meters developed by the company.

►Measurement Problems—Until now were well into World War II, fuel

flow of engines on test were measured by using large wing tanks connected on behind. This was cumbersome and complicated. But now, it means that the chance of getting someone killed—when personnel were at most every other test parameter to handle or handle a fuel flow, one of the most important units.

About 1942, Fisher & Porter introduced its Flowrator instrument into engine test cells. It was an improvement over the balance tank or tank method. It gave continuous readings, it was dependable and gave acceptable results.

By the end of the war, there were thousands of the units in use.

Then along came jet engines and fuels of different viscosity. The fuel measuring problem changed again. The Flowrator, which had not originally



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an average deviation of between 8.2 and 0.24—and further checks at Wright-Patterson AFB, the Air Force approved one of the new Flovator for engine test cells.

None of these units are new in order, and they have been inspected by every one of the major engine manufacturers in the country. Some are currently installed at Alton, and others are going into service.

These instruments are predictable floats with the hydraulic performance completely described in handbooks from Gravity Corrections have to be applied.

Measuring elements are made of 316 stainless steel, and can handle the most corrosive chemical fluids. Model metal, nickel or Hastelloy B or C can also be specified for compatibility.

Operation is on 100 v, 60 cycle ac current. A 3 wire cable is used between transmitter and receiver, the voltage regulation is shipped with the unit.

Spur connections are about the same as for the other glass tube units, but there is a reduction in piping space and the amount of pipe and fittings required.

The indicator—to be mounted on the instrument panel adjacent to the engine gauges' position—is a standard 15 x 18 in. Where panel space is at a premium, there is a miniature 11-in-diameter typographic indicator which can also be used as a precursor to get indication on a translucent screen. Dials have dual or triple scales selected with a switch.

Price of the instrument varies with duty, for piston engines, about \$1,200 is the cost of one Flovator complete with outboard unit. For jet engines with bleedlines or duct engines, the price would amount to \$1,500. Delivery is a matter of 60 to 90 days—DAA.

Recon Laboratory To Go Up at Rome

An aerial reconnaissance laboratory is to be built at the USAF's Rome Air Development Center, Griffin AFB, N. Y., at a cost of \$2.5 million.

In making the announcement of the new facility, the Air Research and Development Command estimated that construction would begin in about six months, that the job would be completed a year from that date, and that another two years later the staff would be at strength of 400 military and civilian personnel.

This lab, one ARDC, will study equipment and procedures for reconnaissance operations, including photography, weather and terrain, of the Air Force's combat commands.

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On page 15, June 2, AFTON'S WEEKLY then appeared an article titled "NO-99 Sets Air Corps Record." The following endorsement was made: "... 1948; since then Hamilton Standard propellers used by the B-10 and the NO-99."

The U. S. Air Force has specified Corbin

I think you will agree with me that in view of these facts, it would be proper for Aviation Week to print a correction in a forthcoming issue.

WILLIAM F. KAMM,
Public Relations Rep
Carter-Vesco Corp
Frasier House
Calicut, N J

We have always admired the accuracy of historical details in *Amadeus*. However, we feel justified in pointing out an error that has caused us much concern.

Why? Dr. Aronson Weiss noted that a "purported" explosives developer, defunctly named the rank of the U. S. Air Force C-40 into Justice, N. Y., some CIA and C&E investigation say," etc.

This diphthong is not a "close-mid diphthong." Its proper name is the first (or "open") diphthong and it is an integral engine part, leaving the engine manifold as its part number. It is studied in the sec-

At our company, it is responsible for the marketing of turbopropellers for U. S. Airlines, we would greatly appreciate your printing a mention to your original article.

E. K. Winkler, Vice President
P. O. Box 35 Building 205
Miami International Airport
Miami 45, Florida

Yours excellent report on the Federal Company program is a recent issue of *American Wheat* reviewed the history and development of this type of instruments.

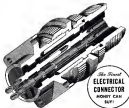
One of the milestones left out of your history and one which you reported upon (Mar. 12, 1951 *Astronomical Wires*) was the Pictorial Computer for the 5,000-mc. Quesada-BE.

It will be noted that this program started in 1960 and the Federal Institute was an integral part of the airborne equipment from the very beginning. The loading tabulations are somewhat different from the pictorial indicators described by your second article, but otherwise, it appears that the instrument may be the "grand daddy" of the Ocean/DVIR Pictorial Computer family.

GEORGE S. LANCZOS and
JUDITH LYSMAN
Nathan Instruments Laboratory
Monrovia, N. Y.

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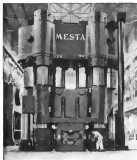
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Abstract

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PRODUCTION



LARGEST FORGE PRESS operating in U.S. is 15,000-ton Mesta operated by Wyman-Gordon at AF facility, North Grafton, Mass. Press is making parts for satellite units.



16,000-TON MORSE FORGE PRESS operated by Morse in Cleveland is a General built unit (Schlumberger). Picture shows manipulator positioning material over lower die block.

USAF Puts Its Money on 'Big Squeeze'

- A revolution in aircraft production is in sight.
- But much teamwork will be needed to make it work.

By George Posner

The USAF is making a lot of money in the heavy press program with an eye to coping worldwide design and production demands in the near and far future. The program represents preparation for more efficient aircraft just around the corner and far planes of the more distant future, whose high speeds will pose big hurdles to present design practices and production techniques.

Overall cost of the 37 large presses to the program was close to \$175 million. Financing and supporting equipment will add \$200,000,000 without more. Yet despite the expenditures and the apparent urgency of the program, there is no urgency for the job.

Little Goes Now-Right now, the largest closed-die "berry" in this case



"SQUEEZE SELECTOR" of Schlumberger puts in shaping sheets upper and lower die blocks, with manipulator (background) holding material to be forged.



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of excellent positions exist for capable, but less experienced, engineers. Some examples of the types of positions now open are:

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shape, however, would create a large explosion of design horsepower and expense, plus a production complication that perhaps couldn't be tolerated in one plant.

► **Offering Power-Airline objection** advanced is that of the high metal cost of dies. Still another is the long lead time from design to finished forging. Thus, when the part is designed, the die blocks must be obtained. These are fabricated from high grade tool steel and large ones require a long processing period. Then the die crates have to be machined and for each class of new forgings a tool run is available—a sort of cut and try procedure to get

the close result desired, which may involve several die alterations. Large tool-makers required on a big forging provide another objection.

Still, the feeling is that proper design can go a long way to take off the headwinds, and with the exception of the lead time problem, which should be cut when a multiplicity of pieces is available.

► **Advantages Seen**—The heavy parts program enthusiasts point out the precise advantages of the high pressure process as forging is against a somewhat limited powder in a heavier type of operation. In die forging the violent impact tends toward machine destruction,

which means high maintenance costs on both machine and dies, as well as an excess down-time. In the large press, the pressure is applied slowly—no shock. There is a dwell-time in the press so that the metal can be forced into the deeper, thinner sections.

Also, there is more opportunity to use die lubricants for longer die life, better surface finish and a reduction of pressure required to move the metal.

In surface parts, the large forging component means less heat and piece better lower parts and less time spent—assembly time takes a big bite of production advantage. Forging, too, offers a high degree of accurate parts using only a sample from one end of the material probably will be the same in one face the other end. With the inherent high strength, lighter weight might be achieved.

Forging proponents are not greatly concerned about the finishing operations required to go from forging to finished part. Enough thinking on large forged parts hasn't fully developed. With more collaboration between designers and press operators (who also will be gaining more experience) the forged weight, finish, weight and corrosion losses will surely be reduced.

Parts produced under the heavy parts program generally would not show the close tolerances of hot-end parts making it more difficult, although some components would cost less. Actual cost factors won't tell until tool runs on the new big presses bring out some of the size advantages.

But metal high cost will not be the controlling consideration. Proponents of the heavy forging act say that in itself is good, even will decrease and produce weight will increase also, the advantages of greater strength of forgings, plus lighter piece weight, will offset cost considerations, in permitting greater speeds per inch of length.

► **Know-Right** now the heavy presses are pushed for the military-commercial use wouldn't justify the cost. This indicates that is possible most of the heavy products would be that done, perhaps one or two being expected for advanced experimental run.

This doesn't mean that commercial uses are ruled out entirely, because applications in fields other than aircraft may be justified.

► **Russia Is Fictitious**—Even though the heavy forging act is a comparatively new one in this country, opinion has already crystallized that the present and potential advantages are too significant to disregard. Russian technicians are the advocates long before their name officially recognized here. Russia is in the picture too having taken over a \$1,000,000 forging press from Germany, and reports are that it has plans on the works for a 65,000-ton unit.



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PRODUCTION BRIEFING

► **An Associates, Inc.,** Teterboro, N. J., has completed key regional operating divisions, each in charge of a new product line. In health division supplies the following: Eastern Aviation Supplies division, Hackensack, N. J.; C. A. Collins, vice president, Midland, Chicago, C. F. Davis, Southport, Dallas, K. B. Kretz, and West Coast, Glendale, F. A. Trower.

► **Allen Aircraft Products, Inc.,** Kewanee, Ohio, maker of radar and fuel system components, has named Fred A. Pitzer, Dayton, as its representative in Arizona, New Mexico, Colorado, Utah, Nevada, Idaho, Wyoming, North and South Dakota, Minnesota, Montana and Alaska. Also includes, H-14 Camp House Bldg., Ft. Worth 7, will serve as Allen representative in Texas, Louisiana, Oklahoma, Kansas, Nebraska, Iowa, Missouri and Arkansas.

► **Douglas Aircraft Co.** has officially put into operation its new line in Chino, Calif., with arrival of first of new line of B-100 Liberator transports scheduled for possible heavy maintenance under Navy contract.

► **Electric Steel Foundry** has been named as West Coast distributor for Registered Metals Corp., Buffalo, N. Y., maker of Rapid-Tec materials for die casting operations.

► **Fennell Electric Ltd.,** Toronto, Canada, has \$1.9 million contract from Canadian Dept. of Defense Production for aircraft electrical systems.

Certificates Of Necessity

Accelerated tax amortization for manufacturers exporting their defense facilities is granted by the government in the form of certificates of necessity.

In the following list of some certificatees, company name is given, followed by product or service, cost of construction, dollar amount for defense expansion but of little likely civilian use after the expansion, and the percentage of the expansion cost allowed for fast write-off. Fast write-off permits property to be depreciated in five years, rather than 20-25 years.

► **Raytheon Mfg. Co.,** Waltham, Mass., Bedford, Quincy, Mass., electronic instrument work under contract \$17,720,141, 10%.
► **Shaw-Wasson-Peard Co.,** Weymouth, N. J., aircraft engine components and tools under \$10,475, 10%.
► **United Aircraft Corp.,** United Mfg. Co., div. Hartford, Conn., aircraft structural components \$425,000, 10%.
► **General Machine Co.,** Houston, Texas, aircraft parts \$1,440, 20%.

► **See Plastic Co.,** Michigan, Mich., aircraft parts \$14,000, 10%.
► **Selwell Automatic Products Co.,** South, Conn., aircraft parts \$67,000, 10%.
► **Servato Electric Products Inc.,** Detroit, Mich., electronic parts \$10,000, 10%.
► **United Steel and Wire Co.,** Detroit, Mich., aircraft parts \$1,000, 10%.
► **Spencer Motors Co.,** North Adams, Mass., aircraft equipment \$10,000, 10%.
► **Alquist, Products, Inc.,** Farmington, N. Y., aircraft parts, very latest contract \$22,000, 10%.
► **Widell Engineering Co.,** Garwood, N. J., aircraft parts \$10,000, 10%.
► **Remond Electric Industries, Inc.,** Detroit, Mich., aircraft parts \$10,000, 10%.
► **Thompson, Inc.,** Farmington, N. J., aircraft parts \$1,000, 10%.
► **East Coast Armaments, Inc.,** Springfield, N. J., aircraft parts \$1,000, 10%.

► **See Plastic Co., Inc.,** Michigan, Mich., aircraft parts \$14,000, 10%.
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No Tubes Used in Heat-Control System

- Micropulse unit is being used in military planes.
- Two new devices replace electronic amplifiers.

By Philip Elias

A unique pulse-type temperature control system, recently developed by Barber-Colman Co., has gone into use in a variety of new military aircraft. It is called Micropulse. A surprising feature of Micropulse, in these electronic times, is that it uses no vacuum tubes.

The new system is controlling cockpit, engine, or windshield heating in temperatures in the Chance Vought F7U's, North American XA2's, F-86A, F-86E, the Douglas A2D-1, XF-4D, and C-125s, the Republic RF-4H, and the F-105s (C-119). Westinghouse is buying Micropulse to control cabin temperatures in one of its Convair-Learners, Barber-Colman says.

According to Barber-Colman, the Micropulse system can hold cockpit temperature within $\pm 12^\circ$, or windshield temperature within $\pm 6^\circ$.

► **Temperature Control.** Barber-Colman says a computer-type pulse system instead of a complex electronic servo system to regulate desired temperature control (the larger the temperature "error," the faster the corrective action).

The valve controlling the flow of hot air is actuated by a motor which operates automatically. The length of the operating interval depends upon the difference between the desired and the actual temperature. The average actuation speed, according to Barber-Colman, therefore varies proportionally to the temperature "error" to give zero rate control without overshooting.

The Micropulse system uses two small newly developed devices in place of electronic amplifiers—the Micropulsator and the Micropulse heater element.

► **Micropulsator.** This unit contains a balanced sensitive relay with two opposite sets of opposing coils (see schematic). The polarity of the voltage applied to the main coil determines which relay the armature will "see-saw," hence whether the left or right-hand contacts will close. If there is no voltage across the main coil, the armature is centered by springs, opening both contacts.



MAINTAINING cabin or cockpit temperatures without electronic amplifiers is feature of new pulse-type control system. Small Micropulsator (center) and heater element (right) housed in container (left) combine to provide signal pulses whose length and frequency vary with difference between actual, selected temperatures.

Two auxiliary coils serve to limit the magnetic effect of the main coil. In normal operation, both auxiliary coils carry equal currents. The two coils thus back each other and exert no magnetic attraction on the armature.

If the current in one auxiliary coil is reduced by external means, the imbalance no longer exists and the other auxiliary coil will exert a magnetic "pull" on the armature. If the current in one auxiliary coil is reduced sufficiently, the magnetic pull of the other auxiliary coil will overcome the magnetic pull of the main coil. When this happens the armature's swinging springs return it to its normal position (both contacts open).

► **Micropulse.**—The Micropulse heater element is the device which controls the amount of current flowing in each of the two Micropulsator's auxiliary coils. The device contains two identical subelements, each consisting of a small

heater element in close proximity to a coil which serves as a magnetic element. Each half of the heater element is connected to one of the two auxiliary coils in the Micropulsator.

When power is applied to the heater element in either half, it causes a temperature rise in the adjoining constant element and thereby increases its resistance. This reduces the current in the associated auxiliary coil in the Micropulsator.

The resistance rate follows an exponential curve and reaches a preselected maximum within a few seconds. When power is removed from the heater, the resistance element cools, and its resistance drops exponentially. This in turn increases the current in the one opposing auxiliary coil.

► **Other Components.**—Major components of the system, in addition to the Micropulsator and Micropulse, include:

- Motor-driven actuator, either split field source or permanent magnet type, which operates the valve in the heating duct to admit more or less hot air.
- Temperature bulb which measures depth duct temperature. Changes in temperature cause a change in bulb resistance. A dual-element bulb is used to give larger resistance changes per degree change in temperature.
- Temperature selector, which operates



SCHEMATIC of Micropulsator and heater element, heart of the system.

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a potentiometer and is used to adjust the desired temperature.

► **Sensing Operation**—The dual-element temperature bulb, temperature switch, and its sensing amplifier are connected into a Wheatstone bridge circuit (see schematic). When supply duct heat pressure is at the selected value, the bridge is balanced and has no voltage output. If duct temperature varies from the selected value, the bridge generates an "error voltage" whose polarity depends upon whether the temperature is too high or too low.

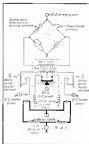
This error voltage is applied to the error coil of the Microprocessor.

To illustrate system operation, let

us assume that supply duct temperature falls below the selected value. The resulting error voltage will cause the Microprocessor amplifier to see an error in clockwise direction along the left-hand control.

This in turn energizes the left-hand control valve actuator relay, closing its two (normally open) contacts. (The two valve actuator relays are connected in series and are not biased in the Microprocessor.) The lower contact applies power to one field of the valve-solenoid valve, causing it to start to position the valve to allow more hot air.

► **Feedback**—Meanwhile the other relay contact has closed, applying power to



SCHEMATIC of typical Microprocessor temperature control system.

the heater in the left-hand heater element. This gradually reduces the error. During the left-hand motion coil, allowing the right-hand coil to exert a counter-clockwise pull on the actuator to oppose the error coil.

Meanwhile, the duct temperature has been rising in the actual system, equalizing the hot-air valve. The change in temperature varies the resistance of the temperature bulb, reducing the error signal from the Wheatstone bridge circuit and the current flowing in the error coil.

After several seconds the current in the left-hand auxiliary coil will have been reduced to the point where the magnetic pull of the right-hand coil may not overcome the pull from the error coil. This allows the actuator to return to center, stopping the valve actuator motor and removing power from the heater element.

► **Winter Interval**—The system responds for several seconds to allow duct temperature to reach a steady-state condition. If after this interval the temperature hasn't yet reached the selected value, the system automatically cycles to give another (smaller) increment of temperature increase. Here's how it is accomplished.

With power restored, the heater element actuator cracks, allowing current in the left-hand actuator coil to rise toward its steady-state value. This in turn reduces the magnetic pull of the right-hand actuator coil.

If the heater's duct temperature hasn't yet reached the selected value, a

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apply duct to "anticipate" changes in cabinet temperature before the change reaches the relevant duct temperature bulb.

The optical temperature bulb uses a thermistor element instead of the normal resistance element. (A thermistor is a resistance with a reverse temperature coefficient, i.e. resistance goes down as temperature goes up.) Because of its inverse temperature characteristic, the thermistor temperature bulb is connected in the lower left leg of the bridge circuit (see schematic on p. 54).

When the Micropalco system is used with a single temperature sensor the

stabilize has no programmed duration ("drop") from the control power. When dual sensors are used, the system has very slight decay. System adjustment is provided to permit changing the control "dead-band" as well as the ratio of pulse length to temperature error.

Between each airport application packets contain individualized problems. Roger Coleman doesn't copy standard off the shelf. Microsoft is a tone.

However, the nests are quickly made blind by using standard building blocks, such as the *Margopostrocy* and the *Margopale* heater element.



Delay Lines

Conduct-regulated electrical devices with time delays up to 100 microseconds are available from Gulton Mfg. Co. Units have low-loss and good temperature stability, according to manufacturer. They can be used as timer, computer, and other electronic applications.

Unit shows has 1.5-microsecond delay time, with a 0.1 rise time. Bandwidth is 2.0 mc, with less than 1 db attenuation. Unit shows weighs 3 oz. Culston Mfg. Co., 712 Durham Ave., Metuchen, N. J.

Film Festival

A new, reliable on-glass monitor for microwave applications is now available from Teflonco Laboratories, Inc. The monitor may be used for power measurements, reactive pick-up loops, pad impedance matching, or as attenuator, a waveguide and resonant cavity. Complete literature is available from the manufacturer.

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The "cylinder-lens" type B-16 antenna will be replaced by a suppressed antenna in the form of the vertical stabilizer of Cosmo's tests on the 2:16 scale model B-16 power increased by using 1/19 scale model on a 31 ft high platform. Cosmo engineers simulate an altitude of 140 feet. The metal and wood model was built in Cosmo's developmental model shop in two weeks.

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AVIATION WEEK, July 7, 1951



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EQUIPMENT



KEEPING AERIAL eye out for MIG and Russian bombers are Lockheed F-94 interceptors (above) attached to Japan Air Defense Force.

Far East Pilots Praise F-94's Durability

Interceptors, boasting major increase in rate-of-climb with afterburners, add beef to Japan Defense Force.

By George L. Christian

USAF Air Base, Japan—The 1950s fighter interceptors wing, charged with patrolling the skies over Japan on a 24-hour basis, is leaving some tracks about operating the afterburner-equipped Lockheed F-94s. Keen to be a first to start schedule, these all-weather interceptors add beef to the Japan Air Defense Force.

Fast Climb—The planes are now in the 50th. They have flown a few test, dual engine flights. But the pilots are enthusiastic about the F-94, especially its increased agility because of the afterburner which boosts its rate-of-climb to a happy figure.

The significance is not hard to detect. The Russian built MIG-17 has been climbing away from anything the United Nations have been able to put into the air. No comment was available as to whether the F-94 and the MIG have yet met in combat.

Pilots and maintenance crews alike pointed the F-94's durability. They pointed out that its Lockheed stub-nose, the F-94, has shown up well in this respect, several having accumulated over 1,000 hr. That is a lot of hours for a jetliner aircraft, the men here point out, to see nothing of many of the hours put on under rough, dirty combat conditions.

There is a vast difference between using an aircraft in a climate of constant dust from burps, parked plunk runway as compared to living a steady climb and descent from runway, combat ships.

To study some of the equipment and maintenance problems encountered by the 50th, this reporter interviewed its commanding officer, Colonel J. Jenkins, its medical officer, Captain R. O. Webb, and many of the pilots crew chiefs and mechanics on the line.

Afterburners—Like all some of the things the men have learned about operation of the afterburners.

The F-94s are currently flying on 300 actual fuel instead of any of the JP fuels. Reason cited by the 50th's spokesmen.

Altitudes—The planes can be lighted at much higher altitudes with 300 actual fuel than with JP-1, for instance.

Talpage—The planes may be allowed to cool to 175 deg. without loss of thrust. With JP-1, 400 deg. was the lowest temperature the talpage could drop to.

Rip, drop, as reality is to obtain maximum rpm, is probably characterized by use of 300 actual. With JP-1, maximum rpm would show a pronounced drop at altitude or after several engine runs had been made on the fuel.

One problem being experienced with

the afterburner is lubricating the cylinder operating pump pull rod. High temperatures melt even the most efficient lubricants. Although high temperature Alkylate (forded in Mobilite) released by Alkylate is now being used, the rods have to be cleaned off and relubricated every 25 hr.

While thrust augmentation of the afterburner is in the neighborhood of 30%, that consumption (at sea level) of jet engine afterburner combustion is a thirty-40 rpm.

The afterburner lights up quite a few below the plane. Volatility of air rushing out of the afterburner are listed as 611 mph at 15 ft. behind the hot, 750 mph at 40 ft., 150 mph at 70 ft. Minimum diameter of the jet blast cone is approximately 16 ft.

Good Control—Pilot of the 39th was enthusiastic about the 39th had control on the jet engines. They passed the control's ability to prevent forward when throttle are cranked to the far left. Another important feature of the jet is its capacity to maintain high temperatures to the maximum 715 C prescribed.

The main fuel control, normally a metering device, does this.

Maintain selected engine rpm.—propulsion of attack changes rate pressure of free air temperature changes.

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ON THE ALERT, all-weather Lockheed F-94 Starfighter awaits action somewhere in Japan.

speeding and resultant possible damage.

- **Increases maximum life span**, with increase in altitude.
- **Maintenance personnel** say the control is flexible and seldom requires attention.
- **Tip Tack Trouble**—The F-94 had other jet fighters (and in Korea) was having trouble with engine low wing stalls. When cleared empty, birds had a tendency to roll along the wing and hang into low-angle stalls. In some cases, substantial damage was inflicted on the aircraft.

The newly adopted jet to drop tanks when still at least half full this means throwing away some 130 lbs. of fuel as provision for jet aircraft, and maintain at least 150 knots with no fuel in the plane.

Jet Decern—To make them all-weather aircraft the F-94s are equipped with electronic heated, rubber de-icing strips on leading edges of wing, stabilizer and landing gear tank vent mast.

A special 1500 Whetstone altimeter was mounted to compare current for the Lockheed and Convair planes. On the wing tank, there is a 15-in. "burner" arm running down the leading edge of the tank in which fuel is applied continuously. An action of the strip which merely does upper and lower sections of the wing, tank or cylinder. Pilot has found the boots quite effective. They do not affect the fuel characteristics of the aircraft, pilot report.

As might be expected, the boots are more effective if used in prior to causing any malfunctions.

The F-94's radio operator has a headset to control the altimeter's output to the boots.

In The Cockpit—Many instruments get trouble-free treatment. These include:

- **Sperry Zuo Radar**. Pilot like the precision and quick response of the instrument and the maintenance it gives when making instrument approaches. It helps them line up with glide path and location with greater ease than with the conventional compass-and-sight system.

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all-weather plane, they find it necessary to have a second bank landing instrument in the cockpit.

• **Edge-of-Radar** 14 gun. Pilot in the instrument's cockpit, making those strikes to the pilot before profits implies interpreting its indications. The unit has an appreciable acceleration, or deceleration, and some passengers have been eliminated.

The main handling, and quick-starting, turbine are highly down life. The gun starts and is operating in less than one minute. Prior to installation of the J-6, power unit had to be plugged into the aircraft at all times because the turbine took 3 min. to crank-and the turbine was on a 2 min. start. Now the gun is ready to go when the plane is.

• **Kollsman 4-5** vernier-type speed indicator. Man dial is calibrated in 10-foot increments. But the vernier dial indicates in 2-foot increments, permitting extreme accuracy in instrument flying.

• **Big, Chain-Fire** indicator beam. Most new large 118-ft diameter parachute chute, incorporate a quick release release system. This allows pilot to release the chute (not the harness) in case of landing in water or a high stall.

Although the use of the idea of a slow descent, the bulk of the chute has its disadvantages. Commanding it into a parachute cockpit with a big pilot makes him so close to the instrument panel that he has to move his hands to see the instruments, they show. They say a pilot could study each a time-up when entering himself during half-on.

• **Air Glow-lamps**—Both air and ground crew served the compressed air gun, changing system. Air is supplied by a 1,400-psi electric motor-driven Comair compressor (gun change are maintained by the Walter Kidde Co.).

Some of the things that like about the compressed air system:

- **Teflon** may now be made with "cold" gas. While changing was used, gas was "hot" during heating and takeoff, creating a potentially



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United Aircraft Products, Inc., Dartmouth, Ohio.

Joint Compound Remains Plastic

A series of Refin's jacking caps, made, used successfully on such King fish aircraft as the de Havilland Comet, Gloster Meteor and English Electric Canberra is now available in this country.

Properties claimed for the products, known as Plastic Hermetics, are:

- They remain plastic in the joint indefinitely.
- Heat, cold and stresses imposed by the aircraft do not dislodge them permanently.
- They make spot welding unnecessary.
- Hermetics are self-healing after an excess breakdown pressure.
- Joints may be broken and remade as often as desired.

The basic product is called Plastic Hermetic 1519. From it are derived three other modifications:

- Plastic Hermetic 5069, Thinner than 1519, it has good electrical characteristics. Typical use is in battery cases. It has the approval of the Air Ministry, which lists it as a ground grouting and all-weather painting site ground and paint.
- Plastic Hermetic 1420, Of a consistency intermediate between 5069 and 1519, it was developed for pressure gas and liquid seals.
- Plastic Hermetic 1276, A pigmented version of 1519, this type is used primarily in some thermal area, where the white qualities are desired.

Manufactured in England by the Kew-Finch Manufacturing Co. Ltd., West Dunton, Middlesex, the materials are used to have without temperature of 1800 F without effect on their sealing qualities. They are also superior in quality, any hydrocarbon or gas, according to the manufacturer.

The maker further states that recently a major U. S. manufacturing company producing aircraft engines tested Plastic Hermetic in an experimental engine and found it "to be as satisfactory."

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WHAT'S NEW

New Books

The Law and Fire of Flying, by Douglas D. Bond, M.D., with preface by Gen. James H. Doolittle, 160 pages including appendix, price \$3.25. Published by International Universities Press, Inc., 227 W. 13th St., New York.

This is an excellent and timely book. The author is to be congratulated for his penetrating and lucid knowledge of what makes flying "hot," and doubly so for presenting his material in a clear and simple style that makes his book easy to read and interesting all the way. Dr. Bond is professor of psychology and department head of the medical school at Western Reserve University. But this is no abstract academic dissertation, and during the war he served as director of psychology with the famed 8th Air Force.

The book's authorial objectivity and analysis of the stress USAF faces, particularly bomber crews, outstanding during training and in combat during World War II's bloody aerial battles should be read by everyone concerned with the human aspect of air power.

Several times, Dr. Bond refers to the need for continuing the selective process through the fire's crews, and provides examples of how pilots developed from draftee recruits because of crashes in the air. Recruits that were subjected to later trials with their deaths.

Some pertinent observations:

- Accidents show serious latent root back to their childhood were too likely to develop doubting, however, were more apt to fight them off successfully, because they didn't want to be separated from flying.

- Fighter pilots, generally speaking, were much less disappointed occasionally to, combat that were bomber crews, because of the former's greater opportunity for individual expression and because the fighter pilots were much less the effects of their work.
- The size of emotional disorders is more bomber crews was directly related to the number of aircraft lost. There was a disproportionate rate of loss when spread out in combat approached 5%.
- Antismash fire was the fire's most potent emotional stress, crews hated this much more than enemy aircraft.
- Experiments indicated that combat fear and emotional disturbances were not "contagious".

Embedded as some interesting but revealing interviews with crashworthy detached air crews made while the subjects were under the influence of drugs—JHB.

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CAB Examiners' Status on Trial

It is argued that ruling them judges might cause stall of administrative procedure, slow case decisions.

If the higher courts uphold the recent decision of a U. S. district judge, Civil Aviation Board's proceedings for an economic and safety proceeding may become even slower.

The case posed by a group of pilots went first to examiners against the Civil Service Commission.

If CAB is other government trial examiner a judge, is it merely an administrative employee? That is the question argued before the Circuit Court of Appeals, D. C., last month. The court may set on the case this month. In the interim, it has stayed the decision of the district court.

District Judge R. J. Linn has ruled that trial examiners are, in fact, the judges—should they equal pay, have the same of their jobs and be assigned cases in rotation rather than being as directly selected for specific cases by their agency managers. Judge Linn ruled the Administrative Procedure Act of 1946 is being quite clear on this. He ruled that cannot cut service regulations choosing examiners in internal government employees are void.

Classified Civil—The most pertinent clause of the procedure act cited by Linn is:

• "Cases shall be assigned to hearing examiners in rotation so far as practicable."

• "Examiners are removable by their employing agency only for good cause determined by the Civil Service Commission" and therefore not subject to budgetary "reductions in force" of their agencies.

• "The Civil Service Commission shall exercise responsibility for examining independently of agency recommendations or ratings."

• "Agency temporarily insufficiently staffed may use examiners selected by the Civil Service Commission from other agencies."

Judge Linn generally upheld the group of common contracting parent and service regulations.

Ad. Court Action—Of the total of about 250 trial examiners in the various government boards and commissions, 12 signed the petition asking the court to void present and service regulations. Of the total of 25 CAB employed examiners, only two are among the 12 plaintiffs.

In arguing the plaintiffs against the civil service regulations, the district court ruled on the above basis of the Administrative Procedure Act. As to the legislative intent of that act, the court says: "It was intended that they [hearing examiners] be very nearly the equivalent of judges, even though operating within the system of federal administrative agencies."

Independent examiners argued Washington generally respects the lower court's finding is legally sound, but still believe it a correct interpretation of the law. They contend that Judge Linn's outrageous literal translation of the provisions set all courts cases in the quasi-judicial sphere of government, unless Congress intends the act in the legal courts liberates the Linn in legislation.

Interpretation Argued—Objections to general administrative under the Linn ruling include:

• Classified ability CAB examiners do have have laid out past periods at various rates of pay; this, have no equal abilities system. Putting all these examples in the same pay scale would tell members, some classroom, as well as pay high cases as unqualified hands and may cause in highly skilled hands.

• Specialization. CAB Executive Director Lewis Vorse's affidavit to the court points out that the Board has 15 economic examiners and seven safety enforcement examiners. The jobs are totally different in their requirements for prior training and experience, he claims. Yet, Vorse says, the court decision would appear "to require the abolition of the distinction presently maintained by the Board between eco-

nomic proceedings and safety enforcement proceedings."

Speed. Suppose, says one observer, that examiner "A" has a case about ready for the Board. He is next in line for an administrative case, but right after that one is a case that "a relatively new and untested a doubtful lot of cases." The translation of best cases for examiner "A" to dig his feet enough to avoid the first assignment and get the second?

One former CAB chairman sums it up this way, "Judge Linn's interpretation is that the law imposes equal competence of the examiners, that interpretation would be like in a vacuum, but a highly respected flow in administrative structure. Judge Linn is a highly respected judge, however, and I have not studied this case in detail."

Another summary of the situation comes from A. H. Brown, vice president of the National Industrial Traffic League:

"One of the major purposes of the [Administrative Procedure] Act was to make hearing examiners independent of pressure from agencies upon whom cases they pass. Another was to assure separation of the functions of investigation and prosecution."

"The attempt is made to apply judicial criteria to the system of administrative agencies. The underlying justification for the existence of these agencies has been that through their use, difficult and complicated matters require expert attention. If that is the case and it is difficult to see how it can be under Section II of the Act and the court's decision thereon, the drastic declassification of administrative procedure cases will be necessary. The matter is extremely important and deserves attention by anyone interested in the effective operation of our administrative agencies."

The Trial Examiners—Importance of the trial examiner in CAB cases can be seen from the fact that CAB often adopts their reasoning and conclusions without any significant change. Examiners' decisions at the Board are now termed "final decisions."

However, this does not necessarily make them any more influential than they were under previous CAB rules of positive housing them "without recorded decisions." The Board there has to vote on either endorsing the examiner's decision and an examiner decision can be set aside without and argument before the Board only if so much makes an appeal in the decision to CAB.

However, since the time of Board members for detailed study of evidence is limited, the reasoning and decision of its trial examiner are generally most influential in the rendering of the final CAB decision.

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clashes, the local airline representative is no longer worth the expense.

As to Wiggins' long range plan to convert to 10 passenger helicopters, Baskette says it is too far off and too costly as an investment.

And the current Spengler equipment across revealed by Wiggins is the most substantial of all the domestic operations on the route and here, Baskette says, "On the basis of past record decisions by the Board, Wiggins' service could not be the source of a competitor of the same service in the future," the consultant says. And Wiggins does not conduct a day-to-day, he concludes.

Then, using past decisions of the Board as a historical precedent, the consultant feels the Wiggins equipment not worth subsidizing any longer.

And neither Northeast Airlines nor any other airline should take over any Wiggins routes, he believes. The services should remain under the same management as the Northeast routes, however.

Six Airlines Amend Loss Restrictions

Civil Aeronautics Board finally has persuaded six major airlines to drop from the fine print from their tariff rates, which formerly outlined rights

to sue for death, injuries and property loss.

The airlines, American, Braniff, Capital, Colonial, Delta and National. The Board announced that the carriers agreed to amend existing regulations. (under 1959) . . . to remove certain unreasonable provisions from their tariffs. The dropping of these "previously unenforced" tariffs would not change liability rules under the laws employed by rail and bus.

Parties say, now the claims against these airlines "passed by the ground law and statutes of limitation and will not be affected by special restrictive provisions in the tariffs limiting the time for filing such claims."

And passengers now have 15 days to file claims for lost property and two years to file suit, compared with 30 days and one year, respectively, which was the practice before.

The Board announced further that the six airlines have agreed to give "reasonable and practical notice to passengers" that there is only a \$300 limit on liability for baggage, and that there is no insurance available at an extra fee, assumed for.

As to the majority of airlines that still maintain "prohibitive" practices, the Board has announced it will "go forward vigorously and successfully with its investigation of carriers who refuse to make changes."

SHORTLINES

► **Alle East Pilots Ann.** requests for permission for Mid-West Airlines employee a demand by CMA. Says the Board "The complaint is well in the air" holds lines from the outset . . . that the company's existence might only be a temporary presence. There is no need to see why the employees should be the expense of the shareholders or the government, now be resolved."

► **American Airlines** reports a new traffic increase of 10,000 passengers weekly, at over \$200,000 on June 15. Previous high of \$197,800 was Aug. 15, 1951. May freight volume hit an all-time high of \$435,000, 40% over a year ago. April volume hit \$798,575 over a year ago. For January May is 12% over a year ago; at mid May 27% and at express only 15%.

► **Braniff International Airlines** expects delivery of the first of its 20 Convair 440s next week. These will cost \$12 million, Braniff recently reported these DC-6s at over \$7 million. Scheduled service will get underway next month.

► **British European Airways** Chief Executive Peter Minterfield says BEA "should be out of the red by next year and showing a profit from the financial year 1954-55." But BEA probably can't cut its deficit this year because of revenue losses of \$45,000 a day during the last shorter air cost of operating, say two new types of "luxury" aircraft into carrier's service.

► **British Overseas Airways** is ordered by Eastern Air Lines of violating its charter on the New York-Norfolk run, which EAL claims is restricted to flights starting or ending in England . . . BOAC Chairman Sir Miles Thomas says the two-Mileton aircraft flights "seem to have tapped outside new markets, but our Montreal and other British services are attracting more business . . . than before." Bookings are 97% ahead of a year ago.

► **Chil Aeronautics Administration** will hold for loss of its C-54 (1940) now for comparison at (Chilabona City). Bids are to be opened July 25.

► **Chicago Municipal Airport** (Midway) will have the most modern air field and its expansion program in the U.S. which has cost \$100,000 construction and equipment program are completed soon, the ATA says.

► **Chil Aeronautics Board Member**

Chin. Geary planned to start negotiating a Japanese bilateral agreement in Tokyo last week. Once this is signed, Japanese International World Airways, operated under Civilian Aeronautics, says contract and partly controlled by Syosetsu Kasei Steamship Line, may start DC-4 from Pacific service to New York. Japanese Airlines, in which Northeast has some stock and operates within Japan, may also get into other national operations.

► **Coast and Geodetic Survey** will provide subscription service to big users of instrument approach charts for VEF managers at \$6 a year. The price is

charges costing of a new chart is changes.

► **Eastern Air Lines** terminated mid rate has been found by CAA at the same 45 cents a ton plus the domestic rate, scheduled to be 1 of last year. The last rate for Apr. 7, 1948, to Dec. 31, 1949, is based at \$3 cents, which yielded \$183,900.

► **KLM Royal Dutch Airlines** now serves Asian Atlantic routes with 777 passenger DC-4s exclusively.

► **Mid Continental Airlines** has scheduled its stockholder meeting to vote on the Braniff merger agreement July 29.

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Our Atlantic Cargo Leadership Has Been Frittered Away by CAB

The present members of the Civil Aeronautics Board have an opportunity to correct the short-sighted decision that divided certificates to both applicants for North Atlantic all-cargo services.

Seaboard & Western Airlines and Transocean Airlines have petitioned the Board to reconsider the trans-Atlantic airfreight case. The Board has agreed to do so.

The adverse decision was rendered on Feb. 9, 1951, and served May 12, 1952, four years and 10 months after Seaboard's application was filed.

Record in the case was closed two and a half years ago—recent history is aviation.

Neither applicant asked one penny of government subsidy, as when implemented in trans-Atlantic air history.

Nowhere in its decision does CAB disclose any confidence in the future of international airfreight. Nowhere does the Board consider the possibility that new business can be created, at that a new carrier might conceivably succeed. It appears to worry most about "lowering the income available to certificated carriers presently in operation."

Since this case was heard, the Board has approved an application to remove one of the three certificated U.S. lines from the picture, and American Overseas has long since been absorbed by Pan American.

Any advantage in shipping bulkfreight is a Seaboard or Transocean certificate would have been "transitory," CAB said. Why? Because the applicants might "undergo the air transportation system upon which their charges depend." Yet CAB itself pointed this help itself to be spent by removing one of the three companies, and creating an even bigger freight vacuum, with results we shall note below.

Nowhere does CAB show any indication that any step—however fitting—toward a really sound air transport system, one requiring no subsidies at all, is a worthy goal. This is how CAB lives up to its mandate, expressed in the Civil Aeronautics Act, to "foster and encourage" aviation, and to consider "competitive to the extent necessary to insure the sound development of an air transportation system."

The Board's contradictory attitude is put in more vivid context by the latest report on routes policy announced by the same, two-way block.

The British government has invited independent airline operators to compete with the state-owned corporations on all freight routes, both existing and new!

Keep in mind CAB's greenlighted record on all new independent carriers, cargo and passenger, as you read what the Minister of Civil Aviation, Miss Llewellyn-Rhod, told the House of Commons May 27:

"We seek to improve the position of the independent companies, which with few exceptions lack long-term security and opportunities of expansion. They cannot strengthen their position if they remain plus finely shared. We therefore intend to give them more scope and security whole, at the same time, not increasing the cost of road traffic to the transporters . . ."

"In particular, we have hopes of independent companies developing the all-cargo market, which is a growing field with great possibilities. . . . The availability of security is one of the most important, and one of the reasons why we are now giving private companies long-term security is to enable them to raise the capital to get the aircraft required. . . . Meanwhile, we are anxious that as the new and expanding freight market and as other carriers outside the existing market the new will go to the people who can give the best service to the public."

Compare that with CAB's comment, in its latest thumbs-down decision, that "a reasonable forecast of the future would indicate that our failure to certificate these carriers will work no financial hardship on either of them since they are presently engaged almost to capacity in work for the military."

Strangely, the Board's decision ignores foreign competition. Yet its own historical policy has contributed to this country's loss of leadership in trans-Atlantic air freight to foreign carriers.

In 1947, Seaboard says, U.S. certificated carriers lifted 72.7 percent of the total air cargo across the North Atlantic. Foreign flag lines carried 27.5 percent.

In 1948, our own certificated lines lifted 53.7 percent, the foreigners 46.3 percent.

In 1951, we lifted only 36.4 percent, the foreign flag lines 63.6 percent. Our two flag lines operated only nine of the 348 all-cargo flights flown by flag carriers. Foreigners flew the others.

For example, TWA flew six, PAA flew three. But KLM flew 176 and the Scandinavian line 150.

"The estimate and the Board noted that PAA and TWA stated that the airfreight potential across the Atlantic was 'limited' and could not reasonably be expected to increase substantially." Seaboard says in its petition: "Carriers with such a philosophy should not be allowed to monopolize a field in which our nation has such a great stake." Although earnings of property over the North Atlantic has shown a healthy increase from 1952 to 1951, that increase was almost entirely an increase in the volume of foreign carriers.

Speaking of philosophy, Seaboard has already backed up its faith in the future of trans-Atlantic airfreight by ordering five Super Constellations, costing \$10 million. It was the first international carrier in the world to produce large-range, over-ocean freight aircraft.

The military side of this case is another story, vitally important, to which CAB pays only lip service in this decision, and which is unrepresented. We shall have more to say on this later.

In reconsidering the case now, the Board can cooperate, in part, for some of the deficient vision, warped logic and faltering courage of its predecessors.

—Robert H. Wood

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